IS 10825-3 (1984): ceramic dielectric capacitors type 1: Part 3 FCCT 2 [LITD 5: Semiconductor and Other Electronic Components and Devices]

BLANK PAGE

Indian Standard (Reaffirmed 2002)

SPECIFICATION FOR CERAMIC CAPACITORS, TYPE 1

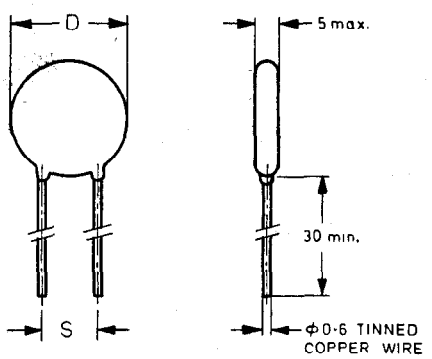
PART 3 FCCT 2

0.1 General — This standard (Part 3) shall be read in conjunction with IS : 10825 (Part 1)-1975. Ceramic dielectric capacitors, Type 1 : Part 1 General requirements and methods of tests.

1. Scope — This standard (Part 3) covers fixed ceramic dielectric capacitors temperature compensated, disc type, insulated.

2. Outline Drawing and Dimensions — The outline drawing and dimensions shall be in accordance with Table 1.

TABLE 1 DIMENSIONS



All dimensions in millimetres.

OUTLINE DRAWING AND DIMENSIONS

Case Size	*D*	*S*
A	6	5
B	8	5
C	11	5
D	15	7·5
E	19	7·5
F	23	7·5

3. Ratings and Characteristics

a) Climatic category	55/85/56
b) Low Air Pressure	8·5 kPa
c) Acceleration	1 km/s²
d) Bump	4 000 Bumps
e) Vibration	10 to 2 000 Hz, 150 m/s²
f) Shock	1 km/s²
g) Capacitance values	*See* Table 2.
h) Selection tolerances	±2 percent, ±5 percent or ±10 percent
j) Rated voltage	500 V dc
k) Rated temperature coefficient	*See* Table 2
m) Tolerance on temperature coefficient	*See* Table 2
n) Stability after endurance	3 percent or 0·5 pF whichever is greater.

Adopted 23 April 1984

Gr 5

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Capacitors Sectional Committee, LTDC 15 and Cap acitors Subcommittee, LTDC 15 : 1 [Ref : Doc : LTDC 15(501)]

TABLE 2 RATINGS

(*Clause* 3)

Capacitance Value	Temperature Coefficient	Tolerance on Temperature Coefficient	Case Size
(1)	(2)	(3)	(4)
pF	*ppm/°C*	*ppm/°C*	
1·0 1·2 1·3 1·5 1·6 1·8	+100	+120 −40	A
2·0 2·2 2·4 2·7 3 3·3 3·6 3·9 4·3 4·7 5·1 5·6 6·2 6·8			B
7·5 8·2 9·1 10 11 12 13 15			C
1·5 1·6 1·8 2·0 2·2 2·4 2·7 3·0 3·3 3·6 3·9 4·3 4·7 5·1 5·6 6·2 6·8	0	+120 −40	A
7·5 8·2 9·1 10 11 12			B
13 15 16 18 20 22		±40	C

(*Continued*)

TABLE 2 RATINGS — *Contd*

Capacitance Value	Temperature Coefficient	Tolerance on Temperature Coefficient	Case Size
(1)	(2)	(3)	(4)
pF	*ppm/°C*	*ppm/°C*	
24 27 30 33 36 39 43 47	0	±40	D
51 56 62 68 75 82 91 100			E
110 120 130 150 160			F
1·6 1·8 2 2·2 2·4 2·7 3 3·3 3·6 3·9 4·3 4·7 5·1 5·6 6·2 6·8	—150	+60 −40	A
7·5 8·2 9·1 10 11 12			B
13 15 16 18 20 22			C
24 27 30 33 36 39 43 47		±40	D

(*Continued*)

TABLE 2 RATINGS — *Contd*

Capacitance Value	Temperature Coefficient	Tolerance on Temperature Coefficient	Case Size
(1)	(2)	(3)	(4)
pF	*ppm/°C*	*ppm/°C*	
51 56 62 68 75 82 91 100	−150	±40	E
2·7 3 3·3 3·6 3·9 4·3 4·7 5·1 5·6 6·2 6·8 7·5 8·2 9·1 10	−750	+250 −120	A
11 12 13 15 16 18 20 22 24 27 30 33			B
36 39 43 47 51 56 62 68		±120	C
75 82 91 100 110 120			D
130 150 160 180 200 220			E

4. Marking — *See* **8** of IS : 10825 (Part 1)-1975.

5. Construction and Workmanship — *See* **6** of IS : 10825 (Part 1)-1975.

6. Tests

6.1 *Classification of Tests*

6.1.1 *Type test* — The procedures for type approval shall be in accordance with IS : 2612-1965 Recommendations for type approval and sampling procedures for electronic components. The sequence of type tests and requirements shall be in accordance with Table 5.

6.1.1.1 *Number of samples* — The manufacturer shall submit 24 specimens in any one temperature coefficient in each size of component for which approval is desired or a minimum of 28 specimens if approval for only one temperature coefficient in a size is desired, in accordance with Table 3. For each additional temperature coefficient in a size 8 more specimens shall be submitted for testing in Groups 3 and 5. The specimens shall be of the highest capacitance value and closest tolerance in each temperature coefficient.

TABLE 3 SCHEDULE OF TYPE TESTS
(*Clause* 6.1.1.1)

Groups	Number of Specimens		Test
	Each Size	One Temperature coefficient in One Size	
(1)	(2)	(3)	(4)
0	24	28	Visual examination Dimensions Capacitance Tangent of loss angle Short term stability Voltage proof (one minute) Insulation resistance
1	6	6	Solderability Robustness of terminations Bump Vibration Shock Acceleration Rapid change of temperature Climatic Sequence
2	6	6	Damp heat (steady state)
3	6	8	Endurance
4	3	3	Resistance to solvents Resistance to soldering heat
5	2	4	Temperature coefficient and Capacitance drift
Spares	1	1	

6.1.2 *Routine tests* — The following shall constitute the routine tests and shall be carried out on each and every capacitor.

a) Visual examination, and

b) Capacitance

6.1.3 Acceptance tests — From the lot which has passed the routine tests, two groups of samples (Group A and Group B) shall be selected and the capacitors, shall be subjected to the tests in accordance with Table 4.

TABLE 4 SCHEDULE OF ACCEPTANCE TESTS

(*Clause* 6.1.3)

Test	AQL	Inspection* Level	D/ND
(1)	(2)	(3)	(4)
Group—A			
Dimensions Tangent of loss angle Insulation resistance Voltage proof	1	II	*ND*
Group—B			
Sub-Group-1			
Short term stability Temperature coefficient and capacitance drift	4	S3	*ND*
Sub-Group 2			
Solderability Robustness of terminations Bump Climatic Sequence	4	S3	*D*
Sub-Group 3			
Endurance—168 hours	4	S3	*N*

D = Destructive *ND* = Non-destructive

**See* IS : 10673-1983 Sampling plans and procedures for inspections by attributes for electronic items.

TABLE 5 TEST SCHEDULE AND REQUIREMENTS

(*Clause* 6.1.1)

Sl. No.	Test	Clause Reference IS : 10825 (Part 1)-1975	Condition of test	Requirements
(1)	(2)	(3)	(4)	(5)
i)	*Group-O (All samples)*			
	a) Visual examination	9.4.1	—	The condition, workmanship and finish shall be satisfactory. Marking shall be legible and indelible.
	b) Dimensions	9.4.2	—	Dimensions shall be according to Fig. 1 and Table 1
	c) Capacitance	9.3.1	—	The capacitance value shall correspond with rated capacitance taking into account the tolerance.
	d) Tangent of loss angle	9.3.2	—	Tan δ shall not exceed the following : a) For Capacitance 5 to 50 pF Tan $\delta = \left(\frac{250}{C} + 7\right) \times 10^{-4}$ b) For rated Capacitance $\geq$ 50pF Tan δ = ·001
	e) Short term stability	9.3.7	—	No random variation of frequency shall occur.
	f) Voltage proof	9.3.5	—	—
	1) Between terminals		At 3 time the rated voltage.	There shall be no breakdown or flashover.
	2) Between terminals connected together and the mounting plate.		The surge current shall not exceed 50mA	
	g) Insulation resistance between terminals	9.3.4	At 500Vdc $\pm$ 10 per-cent or the rated voltage whichever is lower	The value shall be not less than 20 000 MΩ

(*Continued*)

TABLE 5 TEST SCHEDULE AND REQUIREMENTS — *Contd*

Sl No.	Test	Clause Referance IS : 10825 (Part 1)-1975	Condition of test	Requirements
(1)	(2)	(3)	(4)	(5)
ii) *First Group*				
a)	Solderability	9.4.4	—	—
b)	Robustness of terminations	9.4.3	Tensile : 10 N load Bending : 2 bends Torsion : 2 rotations	No fracture of terminations or seals shall occur.
c)	Bump	9.4.6	4000 Bumps	—
1)	Visual examination	9.4	—	There shall be no mechanical deterioration.
2)	Capacitance	9.3.1	—	The change in capacitance from the initial value shall not exceed ± 3 percent or 0·5 pF whichever is greater.
3)	Tangent of loss angle	9.3.2	—	As in Sl No. (i) (d).
4)	Insulation resistance	9.3.4	—	As in Sl No. (i) (g).
d)	Vibration	9.4.5	10 to 2000 Hz, 150 m/s	—
1)	Visual examination	9.4	—	There shall be no mechanical deterioration.
2)	Capacitance	9.3.1	—	The change in capacitance from the initial value shall not exceed ± 3 percent or 0·5 pF whichever is greater.
3)	Tangent of loss angle	9.3.2	—	As in Sl. No. (i) (d).
4)	Insulation resistance	9.3.4	—	As in Sl. No. (i) (g)
e)	Shock	As per in IS : 9000 (Part 7/Sec 1)-1979*	1 km/s²	—
1)	Visual examination	9.4	—	There shall be no mechanical deterioration.
2)	Capacitance	9.3.1	—	The change in capacitance from the initial value shall not exceed ± 3 percent or 0·5 pF whichever is greater.
3)	Tangent of loss angle	9.3.2	—	As in Sl No. (i) (d)
4)	Insulation resistance	9.3.4	—	As in Sl No. (i) (g)
f)	Acceleration	As per IS : 9000 (Part 9)†	1 km/s²	—
1)	Visual examination	9.4	—	There shall be no mechanical deterioration.
2)	Capacitance	9.3.1	—	The change in capacitance from the initial value shall not exceed ± 3 percent or 0·5 pF whichever is greater.
3)	Tangent of loss angle	9.3.2	—	As in Sl No. (i) (d)
4)	Insulation resistance	9.3.4	—	As in Sl No. (i) (g)
g)	Rapid change of temperature	9.5.3	55/85	—
1)	Visual examination	9.4	—	There shall be no fracture or other mechanical deterioration.
2)	Capacitance	9.3.1	—	The change in capacitance from the initial value shall not exceed ± 5 percent or 0·5 pF whichever is greater.
3)	Tangent of loss angle	9.3.2	—	As in Sl No. (i) (d)
4)	Insulation resistance	9.3.4	—	As in Sl No. (i) (g)

Basic environmental testing procedures for electronic and electrical items:

*Part 7 Impact test, Section 1 shock.

†Part 9 Acceleration (steady state) test (*Under Print*)

(*Continued*)

TABLE 5 TEST SCHEDULE AND REQUIREMENTS — *Contd*

Sl No.	Test	Clause Referance IS : 10825 (Part 1)-1975	Condition of test	Requirements
(1)	(2)	(3)	(4)	(5)
	h) Climatic sequence	9.5.1	—	—
	1) Dry heat	9.5.1.2	At + 85°C	—
	I) Insulation resistance (hot)	9.3.4	—	The value shall be not less than 1000 M Ω
	II) Capacitance	9.3.1	—	The change in capacitance from the initial value shall not exceed ±5 percent or 0·5 pF whichever is greater.
	2) Damp heat (cyclic)	9.5.1.3	One cycle	—
	3) Cold	9.5.1.4	At —55°C	—
	I) Working test		During the last 10 minutes of the period of exposure the rated voltage shall be applied to the specimens.	There shall be no breakdown or flashover.
	4) Low air pressure	9.5.1.5	8·5 kPa During the last minute the rated voltage shall be applied to the samples.	—
	5) Damp heat (cyclic)	9.5.1.6	Remaining cycle	—
	I) Working test		Within 15 minutes after removal from the chamber, and before the recovery period the rated voltage shall be applied for 5 minutes.	There shall be no breakdown or flashover.
	Final measurements			
	a) Visual examination	9.4	—	There shall be no corrosion, fracture or other mechanical deterioration. Marking shall be legible and indelible.
	b) Voltage proof	9.3.5	—	There shall be no breakdown or flashover.
	c) Insulation resistance	9.3.4	To be completed within one hour after recovery.	The value shall be not less than 10,000 M Ω.
	d) Capacitance	9.3.1	—	The change in capacitance from initial value shall not exceed ± 5 percent or 0·5 pF whichever is greater.
	e) Tangent of loss angle	9.3.2	—	As in Sl. No. (1) (d)
iii)	*Second Group*			
	a) Damp heat (steady state)	9.5.2	56 days	—
	1) Electrical loading	—	a) Throughout the period of exposure one half of the specimens shall have the rated voltage applied between the terminations.	There shall be no breakdown or flashover.
			b) Within 15 minutes after removal from the chamber the remaining specimens shall have the rated voltage applied between the terminations for 5 minutes.	There shall be no breakdown or flashover.
	2) Visual examination	9.4	—	There shall be no corrosion, fracture or other mechanical deterioration. Marking shall be legible and indelible.

(*Continued*)

TABLE 5 TEST SCHEDULE AND REQUIREMENTS — *Contd*

Sl No.	Test	Clause Reference IS : 10825 (Part 1)-1975	Condition of test	Requirements
(1)	(2)	(3)	(4)	(5)
	3) Voltage proof	9.3.5	—	There shall be no breakdown or flashover.
	4) Insulation resistance	9.3.4	—	The value shall be not less than 10 000Ω .
	5) Capacitance	9.3.1	—	The change in capacitance from the initial value shall not exceed ± 5 percent or 0·5 pF whichever is greater.
	6) Tangent of loss angle	9.3.2	—	As in Sl No. (i) (d)
	7) Solderability	9.4.4	—	
iv)	*Third Group*			
	a) Endurance test	9.6	At +85°C	
	1) Visual examination	9.4	—	There shall be no fracture or any other mechanical deterioration. Marking shall be legible and indelible.
	2) Capacitance	9.3.1	—	The change in capacitance from the initial value shall not exceed ± 3 percent or 0·5 pF whichever is greater.
	3) Tangent of loss angle	9.3.2	—	As in Sl No. (1) (d)
	4) Voltage proof	9.3.5	—	As in Sl No. (1) (f)
	5) Insulation resistance	9 3.4	—	The value shall be not less than 10 000Ω .
v)	*Fourth Group*			
	a) Resistance to solvents	As per IS : 9000 (Part 20)-1979*	—	The marking shall remain legible and shall not smear or rub off. There shall be no visible damage or deterioration of the capacitor body.
	b) Resistance to soldering heat	9.4.4	—	—
	1) Visual examination	9.4	—	There shall be no mechanical damage.
	2) Capacitance	9.3.1	—	The change in capacitance from the initial value shall not exceed ± 0.5 percent or 0.5 pF whichever is greater.
	3) Tangent of loss angle	9.3.2	—	As in Sl No. (i) d)
	4) Insulation rasistance	9.3.4	—	As in Sl No. (i) (g)
vi)	*Fifth Group*			
	a) Temperature coefficient	9.3.3	—	The value of temperature coefficient shall be as specified in Table 2
	b) Capacitance drift		—	The value shall be within 0·2 percent or 0·05 pF whichever is greater.

*Basic environmental testing procedures for electronics and electrical items : Part 20 Resistance to cleaning solvents and performance of markings.

Printed at Printrade, New Delhi, India